

ABSTRACT OF THE DISCLOSURE

Disclosed herein is a magnetic powder which can provide magnets having excellent magnetic properties and having excellent reliability especially excellent heat stability. The magnetic powder is composed of an alloy composition represented by $R_x(Fe_{1-a}Co_a)_{100-x-y-z}B_yM_z$ (where R is at least one kind of rare-earth element excepting Dy, M is at least one kind of element selected from Ti, Cr, Nb, V, Mo, Hf, W, Mn, Zr and Dy, x is 7.1 - 9.9at%, y is 4.6 - 8.0at%, z is 0.1 - 3.0at%, and a is 0 - 0.30), and the magnetic powder being constituted from a composite structure having a soft magnetic phase and a hard magnetic phase, wherein when the magnetic powder is mixed with a binding resin and then the mixture is subjected to injection molding or extrusion molding to form a bonded magnet having a density ρ [Mg/m³], the maximum magnetic energy product $(BH)_{max}$ [kJ/m³] of the bonded magnet at a room temperature satisfies the relationship represented by the formula $(BH)_{max}/\rho^2 [\times 10^{-9} J \cdot m^3 / g^2] \geq 2.10$, and the intrinsic coercive force H_{CJ} of the bonded magnet at a room temperature is in the range of 400 - 760 kA/m.

TABLE 1

Sample No.	Alloy Composition	Average Crystal Grain Size (nm)
Comp. Ex. 1	(Nd _{0.8} Pr _{0.2}) _{8.8} Fe _{bal} Co _{7.5} B _{5.9}	55
This Invention 2	(Nd _{0.8} Pr _{0.2}) _{8.8} Fe _{bal} Co _{8.0} B _{5.7} Nb _{1.0} Ti _{0.8} Dy _{0.2}	32
This Invention 3	(Nd _{0.7} Pr _{0.3}) _{9.0} Fe _{bal} Co _{5.0} B _{5.7} Cr _{1.0} Mo _{0.2} Hf _{0.3}	28
This Invention 4	(Nd _{0.5} Pr _{0.5}) _{8.9} Fe _{bal} Co _{8.0} B _{5.8} Zr _{0.8} Mn _{0.7} W _{0.5}	30
This Invention 5	(Nd _{0.4} Pr _{0.6}) _{8.6} Fe _{bal} Co _{7.0} B _{5.5} Ti _{0.5} Cr _{0.5} Zr _{0.5}	26
This Invention 6	(Nd _{0.8} Pr _{0.2}) _{8.2} Fe _{bal} Co _{7.0} B _{5.7} Mo _{0.8} W _{0.7} V _{0.5}	35
Comp. Ex. 7	(Nd _{0.7} Pr _{0.3}) _{8.6} Fe _{bal} Co _{5.0} B _{5.8} Dy _{1.0} Mn _{1.0} Cr _{1.5}	57

TABLE 2

Sample No.	ρ (Mg/m ³)	Br (T)	H _{coj} (kA/m)	(BH) _{max} (kJ/m ³)	(BH) _{max} /ρ ² (×10 ⁻⁹ J·m ³ /g ²)	Br/ρ (×10 ⁻⁶ T·m ³ /g)	Example 1 Irrespective Flux Loss (%)
Comp.Ex.1	5.75	0.71	388	62	1.88	0.123	-10.0
This Invention 2	5.75	0.79	455	91	2.75	0.137	-2.8
This Invention 3	5.76	0.81	524	96	2.90	0.140	-2.6
This Invention 4	5.74	0.80	565	94	2.84	0.139	-2.4
This Invention 5	5.76	0.81	541	97	2.92	0.141	-3.0
This Invention 6	5.75	0.78	571	88	2.66	0.135	-3.3
Comp.Ex.7	5.76	0.70	468	66	2.00	0.121	-6.6

TABLE 3

Sample No.	ρ (Mg/m ³)	Br (T)	H_{cJ} (kA/m)	$(BH)_{max}$ (kJ/m ³)	$(BH)_{max}/\rho^2$ ($\times 10^{-9}$ J·m ³ /g ²)	Br/ρ ($\times 10^{-6}$ T·m ³ /g)	Irrespective Flux Loss (%)
Comp.Ex.1	6.10	0.74	387	70	1.88	0.122	-10.2
This Invention 2	6.12	0.83	452	103	2.74	0.136	-2.9
This Invention 3	6.11	0.86	522	108	2.89	0.141	-2.7
This Invention 4	6.10	0.85	563	106	2.84	0.139	-2.5
This Invention 5	6.09	0.86	538	108	2.91	0.142	-3.1
This Invention 6	6.12	0.82	565	100	2.66	0.134	-3.4
Comp.Ex.7	6.11	0.74	463	74	1.99	0.121	-6.7

Example 2